(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
5 April 2001 (05.04.2001)

PCT

(10) International Publication Number
WO 01/24499 A1

(51) International Patent Classification[7]: H04M 7/00, H04Q 3/00

(21) International Application Number: PCT/US00/25624

(22) International Filing Date:
19 September 2000 (19.09.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/404,725 24 September 1999 (24.09.1999) US

(71) Applicant: NOKIA NETWORKS OY [FI/FI]; P.O. Box 321, FIN-00045 Helsinki (FI).

(71) Applicants and
(72) Inventors: SENGODAN, Senthil [IN/US]; 2 Kimball Court #506, Woburn, MA 01801 (US). BANSAL, Rajesh, Chandra [US/US]; 7 Larch Road, Acton, MA 01720 (US).

(74) Agents: STOUT, Donald, E. et al.; Antonelli, Terry, Stout & Kraus, LLP, 1300 N. Seventeenth Street, Suite 1800, Arlington, VA 22209 (US).

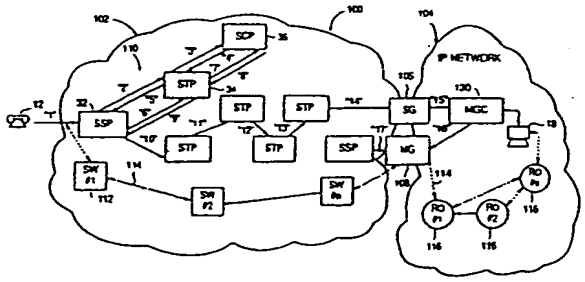
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:
— *With international search report.*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: IP TELEPHONY SYSTEM AND METHOD OF OPERATION THEREOF USING SS7 NETWORK



(57) Abstract: The invention is a communication system (100) and a method of communication. A communication system in accordance with the invention includes a first network (102) containing a plurality of first network entities (12) which originate and receive first network communications and to which the first network communications are addressed by a first address type associated therewith; and a second network (104), coupled to the first network, containing a plurality of second network entities (18) which originate and receive second network communications and to which the second network communications are addressed by a second address type associated therewith and which, in response to the second type of address, transmits second network communications associated with the second address type to at least one second network entity. The second network also receives first network communications from the first network entities and delivers the first network communications to at least one second network entity. A managing network (557), associated with the first network, manages operation of the first network including first network communication setup and routing and control thereof and provides address mapping between an address of the first type of the at least one second network entity to which the first network communications are addressed from the first network entities and an assigned address of the second type of the at least one second network entity which receives the first network communications and provides the assigned address to the second network in association with the second network communications. The second network delivers the first network communications to the at least one second network entity addressed with the assigned address of the second type associated with the second network communications.

WO 01/24499 A1

IP TELEPHONY SYSTEM AND METHOD OF OPERATION THREOF USING SS7 NETWORK

Technical Field

The present invention relates to systems and methods for providing communications from circuit switched network (CSN) telephone systems to packet data networks such as internet protocol (IP) telephone systems.

Fig. 1 illustrates a system diagram of a prior art communication system 10 having a plurality (one has been illustrated) of telephone entities 12 which may be diverse in design, such as conventional telephones, which are part of a CSN 14. The plurality of telephone entities 12 originate and receive first network communications in a conventional manner. The entities 12 have the first network communications addressed thereto by a first address type (e.g. dialed numbers). In a conventional CSN, the first address type is based upon E.164 type numbers. A packet data network 16, which may be an IP network, also contains a plurality (one has been illustrated) of entities18 which may be diverse in design, such as telephones, and are designed to operate with a packet data protocol (e.g. the IP protocol). The entities 18 originate and receive packet data communications and have IP network packet data communications addressed thereto by a second type of address type (e.g. alphanumeric characters) associated therewith. In a conventional IP network configuration, the second network address type is based upon alphanumeric characters, such as those used with email-style or URL style addresses. The CSN 14 is coupled to the packet data network 16 by a gateway 20 permitting communications originating from the plurality of entities 12 to pass through the gateway 20 and be received by the plurality of entities 18.

Conventional CSN network telephone handsets have a numeric keypad preventing entry of alphanumeric characters which precludes direct dialing of packet data network addresses.

The unavailability of an alphanumeric keypad necessitates a mechanism by which conventional telephone numbers based on the E.164 standard are assigned to entities18 to which communications are to be directed by the plurality of entities 12 using only numbers. Work is currently underway with ETSITIPHON for assigning E.164 numbers to IP telephones and other devices.

Once a telephone number, based upon numeric digits used to address the entities 12 in the CSN 14, has been assigned to communicate with an entity 18, such as an IP telephone, the caller from one of the plurality of entities 12 merely dials a numerical based number which is translated by a conversion mechanism into the necessary IP address in packet data IP network 16 which controls the delivery of the telephone call to at least one of the plurality of the entities 18 once the call has passed through the gateway 20. The entities 18 further may be addressed by other addressing mechanisms, such as a domain name.

It is necessary for the successful dialing of the number of the at least one entity 18 based upon the first address type of the CSN 14 to return the corresponding address of the called entity 18 based upon the second type of address used by the packet data IP network 16. Work is currently ongoing by the TENUM (Telephony Numbering) working group (WG) in the IETF.

In Fig. 1 arrow 22 represents a telephone call originated by one of the plurality of entities 12 of the CSN 14 which is dialed using the addressing type of the CSN (numerical digits) which is directed to one of the plurality of the entities 18 in the packet data IP network 16 via gateway 20. As is known, the number of the called entity 18, based upon the addressing type of the CSN 14, has already been assigned an IP address (or related address) when the telephone call is initiated. The process of obtaining the address of the called entity 18, based upon the second address type of the packet data IP network 16, is currently performed in the packet data network. Brown, "E.164 Resolution" Internet Draft, work in process, November 1998, describes this approach.

Additionally, it has been suggested without specific implementation details that the address mapping between the address of the called entity 18 based upon the addressing of the CSN 14 and the corresponding address of the called entity 18 in the packet data IP network 16 may be performed in the CSN.

Standards have been proposed, such as H.323, for permitting communications via gateways, such as gateway 20 between CSN networks and packet data networks. However, such standards do not provide a mechanism by which the mapping between the address of the entities 18, based upon the CSN 14 addressing type and the corresponding address type ~~of~~ the packet data IP network 16 is accomplished. A mechanism is needed which facilitates the obtaining of the corresponding address of the second type used in the packet data IP network 16 which permits the completion of the communication to the called entity 18 upon the generation of a first network communication by an entity 12 using a first network address type which does not involve high complexity or additional expense to the cost of operating the CSN 14.

Fig. 2 illustrates a block diagram of Signalling System #7 (SS7) from Chapter 5 of Telecommunications Protocols, Russell 1997, McGraw-Hill. The SS7 network 30 illustrated in Fig. 2 performs managing functions for CSNs used for providing conventional telephone functions and other applications, such as cellular. The SS7 network 30 is capable of managing operation of the CSN 14 illustrated in Fig. 1, including communications setup and routing of communications in the CSN and further provides control functions thereof. The SS7 network 30 performs mapping of 800/888 numbers (toll-free numbers in the United States) or 900 numbers (special toll numbers) to physical numbers. Mapping of a specific local number to physical numbers depends upon the calling party location or mapping of emergency numbers (911) and directory assistance numbers (411) to the corresponding location depending on the calling party's location.

As illustrated in Fig. 2, a typical SS7 network 30 is comprised of a plurality of service switching points (SSP) 32, a plurality of signal transfer points (STP) 34, and a plurality of service control points (SCP) 36. The SSPs 32 originate SS7 messages and are typically found in an end office telephone switch. The SSPs 32 originate SS7 messages after determining which interoffice trunk will be used to connect the call. A SS7 message is sent to an end office on the remote end of the circuit and contains a request for connection. The SSPs 32 also originate an SS7 message when determination of an interoffice circuit to connect the call is to be made. The SSPs 32 originate a query to an SS7 node which will provide a connection to a database connected to the SCP 36. The SSPs 32 are responsible for routing SS7 messages through the network. Once the necessary routing information has been obtained through the STP 34 connectivity to a database, the SSP 32 begins connection of network parts to handle the call.

The STP 34 is responsible for routing traffic through the SS7 network 30 and does not originate any traffic other than performing SS7 network management. The STP 34 is an intermediate point in the SS7 network 30 providing some processing and routing of SS7 messages. The traffic directed to the signal transfer point may be circuit related which is typically originated by a first SSP 30 and sent to another SSP to request a connection on a particular circuit which does not allow any processing by the STP 34 and results in the message simply being passed along to its destination STP. Circuit related traffic typically involves interactions with a database which is connected to the SCP 36.

When a query is made to a database, the SSP 32 does not typically know the address of the specific database it needs to query. The STP 34 provides global title translation (GTT) to determine whether the query should be directed with the STP 34 looking at the signalling connection control part (SCCP) to determine which digits were dialed and makes its routing decision based on these global title digits.

The SCPs 36 are the front end to subsystems, such as databases and manage access to databases and/or more than one subsystem. Each database is addressed through a subsystem number that identifies the application served by the database. The subsystem numbers are predefined by a network operator. Subsystem management is the responsibility of both the STP 34 and the SCP 36.

In the SS7 network 30, transaction capabilities application part (TCAP) protocol is used for non-circuit related signalling, such as database queries for 800 services. TCAP is used whenever a database is used, whenever a database is involved or when invoking a feature in another switch. TCAP provides management of the queries and support for multiple transactions in one transmission and also includes error detection/segmentation and reassembly. TCAP is divided into three portions, which are the transaction portion, which identifies whether or not a following component portion carries a single transaction or multiple ones, an invoke portion and a parameter set sequence portion.

As illustrated by the exemplary combination of SSPs 32, STPs 34 and SCPs 36 of Fig. 2, various interconnecting data links are necessary, such as data links "A"-"E". "A" data links connect SSPs 32 to STPs 34 or a STP to a SCP 36; "B" links connect STPs; "C" links connect STPs which are always provided in pairs and function as cross links; regional STPs 34 are connected together by "D" links which are used for messages being routed from one STP to its corresponding regional signal transfer point when congestion occurs; and "E" links provide connections between SSPs outside an area such as between local access and transport areas (LATAs).

Fig. 2 represents one exemplary implementation of an SS7 network 30. It should be understood that numerous permutations of SSPs, STPs and SCPs are used in the prior art. Furthermore, the SS7 network 30, is illustrated in Fig. 2 without connection to the network which it manages, such as the circuit switched network 14 of Fig. 1.

DISCLOSURE OF THE INVENTION

The present invention is a communication system and a method of communication which utilizes a managing network, which is preferably an SS7 network, operating in association with a first network to perform management of the first network including first network communications setup, routing and control, and also providing address mapping between an address of a first type used by the first network and an address of a second type used by at least one second network to support communications between entities originating communications in the first network which are addressed to and delivered to entities in the second network. First network communications are addressed from the originating first network entities with a first address type which has an assigned address of the second type of the at least one second network entity which receives the first network communications. The first network entities (calling entities) are resident in the first network and the second network entities (called entities) are resident in the second network. The invention utilizes the already existent managing network of the first network to perform the aforementioned address mapping between the first and second address types of the second network entity to which the first network communications are addressed without requiring modification of the architecture of either the first network or the second network.

The preferred form of the managing network is an SS7 network utilizing the transaction capability application part (TCAP) query utilized in the prior art for performing conventional SS7 network functions to additionally perform a new function of obtaining the destination address of at least one second network entity in the second network based upon the address type in the first network of the entity in the second network which is to receive the first network communication. Furthermore, the managing network query (preferably TCAP) optionally obtains additional information used for qualifying the first network communications between a first network entity originating the first network communications and the at least one second

network entity receiving the first network communication. The additional information which may have diverse applications may be the specification of a level of service, a security level, a quality of service, a billing mechanism used at least partially in the delivery of the first network communication from an originating first network entity to at least one second network entity and furthermore, may specify one or more service providers to be used by the second network in delivering the first network communications by the second network to the at least one second network entity, such as, but not limited to IP service providers. Furthermore, in view of the TCAP query capability of supporting multiple transactions in one transmission, a single TCAP query may be used to perform the conventional first network management functions as well as the performing of the additional function of address mapping between the addresses of the first and second network types of the second network entity receiving the first network communications in the second network and the obtaining of the additional information to perform the optional functions as discussed above.

In a preferred embodiment of the present invention, the first network is a CSN with the first address type used therein being an E.164 address and the second network is a packet data network which, in a preferred embodiment, is an IP network with the second address type used therein being an IP address. Furthermore, while a preferred application of the present invention is for providing address mapping permitting the connection of telephone communications originating in a CSN to a packet data network, it should be understood that the present invention is not limited thereto with the present invention also not being limited to the managing network being a SS7 network.

A communication system in accordance with the invention includes a first network containing a plurality of first network entities which originate and receive first network communications and to which the first network communications are addressed by a first address type associated therewith; a second network, coupled to the first network, containing a plurality

of second network entities which originate and receive second network communications and to which the second network communications are addressed by a second address type associated therewith and which, in response to the second type of address, transmits second network communications associated with the second address type to at least one second network entity, the second network also receiving first network communications from the first network entities and delivering the first network communications to at least one second network entity; and a managing network, associated with the first network, which manages operation of the first network including first network communication setup and routing and control thereof and which provides address mapping between an address of the first type of the at least one second network entity to which a first network communication is addressed and an assigned address of the second type of the at least one second network entity and provides the assigned address to the second network in association with the first network communications; and wherein the second network delivers the first network communication to the at least one second network entity addressed with the assigned address of the second type associated with the first network communication. The first network may be a circuit switched network; and the second network may be a packet data network. The first address type may be an E.164 address; and the second address type may be an IP address. The first network communication may be a telephone communication. The managing network may be an SS7 network. The managing network may use at least one service control point (SCP) to provide the mapping between an address of the first type of at least one second network entity to which the first network communications are addressed from the first network entity and the associated address of the second type to which the first network communications are transmitted by the second network in response to the associated address of the second type. A transaction capability application part (TCAP) query may be used to accomplish the setup and the address mapping. The managing network may further obtain from at least one service control point (SCP) information stored therein

identifying a level of service to be used in completing the first network communications between the first network entity addressing the first network communications and the at least one second network entity to which the first network communications are addressed and may use the obtained information to complete the transmission of the first network communication between the first network entity and at least the second network with the level of service. The at least one service control point (SCP) may store additional information qualifying the first network communications between a first network entity originating the first network communications and at least one second network entity receiving the first network communications. The additional information may specify a security level to be used in the first network communications between the first network entity originating the first network communications and the at least one second network entity receiving the first network communications which controls at least in part transmission of the first network communications between the first and second network entities. The additional information may specify a quality of service to be used at least in part in transmitting the first network communications between the first network entity originating the first network communications and the at least one second network entity receiving the first network communications. The additional information may specify a billing mechanism to be used at least in part in charging for the first network communications transmitted between the first network entity originating the first network communications and the at least one second network entity receiving the first network communications. The additional information may identify at least one service provider to be used by the second network in delivering the first network communications by the second network to at least one second network entity. A single transaction capability application (TCAP) query may be used to provide setup of the first network communications addressed to the at least one second network entity and the address mapping.

A method of communication in a communication system including a first network containing a plurality of first network entities which originate first network communications and to which the first network communications are addressed by a first address type, a managing network, associated with the first network, which manages operation of the first network including communication setup and routing and control thereof, and a second network, coupled to the second network, containing a plurality of second network entities which originate second network communications and to which the second network communications are addressed by a second address associated therewith and which, in response to the second type of address transmits the second network communications associated with the second address type to at least one second network entity with the second network also receiving first network communications from the first network entities and delivering the received first network communications to at least one second network entity in accordance with the invention includes originating a first network communication from a first network entity for transmission to at least one second network entity; using the managing network to setup and route the first network communication to the second network and to map an address of the first type of the at least one second network entity to which the first network communication is addressed with an assigned address of the second type of the at least one second network entity to which the first communication is addressed; and transmitting the first network communication in response to the assigned address of the second type with the second network to the at least one second network entity. The first network may be a circuit switched network; and the second network may be a packet data network. The first address type may be an E.164 address; and the second address type may be an IP address. The first network communication may be a telephone communication. The managing network may be an SS7 network. The managing network may use at least one service control point (SCP) to provide the mapping between an address of the first type of at least one second network entity to which the first network communications are addressed from the first

network entity and the associated address of the second type to which the first network communication is transmitted by the second network in response to the associated address. A transaction capability application part (TCAP) query may be used to obtain a routing number of the at least service control point storing the address mapping. The managing network further may obtain from at least one service control point (SCP) information stored therein identifying a level of service to be used in completing the first network communications between the first network entity addressing the first network communications and the at least one second network entity to which the first network communications are addressed and may use the obtained information to complete the transmission of the first network communication between the first network entity and at least the second network entity with the level of service. The at least one service control point (SCP) may store additional information qualifying the first network communications between a first network entity originating the first network communications and at least one second network entity receiving the first network communications. The additional information may specify a security level to be used in the first network communications between the first network entity originating the first network communications and the at least one second network entity receiving the first network communications which controls operation of at least part of the first and second networks in transmitting the first network communications between the first and second network entities. The additional information may specify a quality of service to be used at least in part in transmitting the first network communications between the first network entity originating the first network communications and the at least one second network entity receiving the first network communications. The additional information may specify a billing mechanism to be used at least in part in charging for the first network communications transmitted between the first network entity originating the first network communications and the at least one second network entity receiving the first network communications. The additional information may identify at least one service provider to be

used by the second network in delivering the first network communications by the second network to at least one second network entity. A single transaction capability application (TCAP) query may be used to provide setup of the first network communications addressed to the at least one second network entity and the address mapping and optional obtaining of the additional information.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 illustrates a block diagram of a prior art data communications system which provides telephone communication between a CSN and a packet data network ;

Fig. 2 illustrates a block diagram of a SS7 network in accordance with the prior art;

Fig. 3 illustrates a block diagram of a communication system in accordance with the present invention;

Fig. 4 illustrates communications in accordance with the invention for performing address mapping utilizing an existing managing network which controls a telephone network or another network in accordance with a first embodiment of the present invention; and

Fig. 5 illustrates communications in accordance with the invention for performing address mapping utilizing an existing managing network which controls a telephone network or another network in accordance with a second embodiment of the present invention.

Like numbers identify like parts throughout the drawings.

BEST MODE FOR CARRYING OUT THE INVENTION

Fig. 3 illustrates a communication system 100 in accordance with the present invention. The communication system is comprised of a first network 102 and a second network 104 which are connected by a signalling gateway 106 and a message gateway 108. The first network 102 may be in accordance with the CSN 14 of the prior art and the second network 104 may be in

accordance with the packet data IP network 16 of the prior art of Fig. 1. However, it should be understood that the invention is not limited to the communication system 100 or the first and second networks 102 and 104 illustrated in Fig. 3 with other network architectures being equally applicable to the practice of the invention. The first network 102 includes a managing network 110 comprised of SSPs 32, STPs 34 and SCPs 36, which are in accordance with Fig. 2 as described above except that at least one additional function is performed by the managing network. The at least one additional function of the managing network 110 includes address mapping between an address of a destination entity 18 in the second network identified by an address of the first type used by the first network 102 to address entities 12 and an assigned address of the second type of the entity 18 used by the second network to deliver communications to second network entities and further may include identifying types of service, such as a level of service to be used in completing the first network communications between the first network entity 12 and at least one second network entity 18 and the optional storing of additional information in at least one SCP 36 qualifying the first network communications between the first network entity 12 originating the first network communications and at least one second network entity receiving the first network network communications. The additional information may perform diverse functions within the communication system 100 including, but not limited to, specifying a security level to be used at least in part in the first network communications between the first network entity originating first network communications and the at least one second network entity receiving the first network communications, a quality of service to be used at least in part in transmission of the first network communications between the first network entity originating the first network communications and the at least one second network entity receiving the network communications, and a billing mechanism to be used at least in part to charge for transmission of the first network communications between the first network entity originating the first network communications and the at least one second network

entity receiving the first network communications. The additional information may further identify at least one service provider to be used by the second network 104 in delivering the first network communications by the second network to at least one second network entity 18. Preferably, but not limited thereto, a single transition capability application part (TCAP) query is used by the managing network 110 to provide the prior art call setup and the present invention's address mapping, obtaining of the additional information specifying level of service, security level, quality of service, or a billing mechanism and at least one service provider to be used by the second network.

The first network is further comprised of a plurality of switches 112 which may be implemented in many different ways with the illustrated architecture indicating a possible logical function without reference to a physical location. The switches 112 perform circuit switch routing of the first network communications 114 represented by dotted lines which originate from first network entities 12 and are delivered ultimately to second network entities 18 in the second network 104. The switches 112 may be located at the same or physically dispersed locations in the network. The first network communications 114 are transmitted between the first network entity 12 and the second network 18 after call setup is completed by the managing network 110 as is described in more detail below and further call setup is performed by the second network 104 which results in the first network communications passing through the aforementioned switches 112, message gateway 108, and through a series of routers 116 to the second network entity 18.

The use of the SS7 network 110, which functions as a managing network of the first network 102 to perform address mapping and other functions in accordance with the present invention, is described as follows. In Fig. 3 the first network entity 12 may be, without limitation, an ISDN telephone making a call to a second network entity 18 which is an IP telephone. It is assumed that a global code, e.g. 999, has been assigned as a prefix to E.164

numbers assigned to the second network entity 18 in the second network 104. When the first network entity 12 dials the E.164 number of the second network entity 18, a Q.931 setup message is sent from the first network entity 12 to the central office (not illustrated) as represented by message "1". The SSP 32 receiving message "1" is housed in a central office. Based on the prefix 999 of the dialed number, the SSP 32 receiving the message "1", determines that the dialed number is an IP telephone message. The SSP 32, which receives the message "1", then decides to initiate a TCAP query to determine the routing number as well as the IP address assigned to the dialed E.164 number. The TCAP query, as described below, is illustrated as message flows "2", "3", "4" and "5". Upon query to the database associated with the SCP 36 receiving the query represented by message "3", it may be determined that an additional input is needed from the user of the first network entity 12. Such additional input may be necessary to determine a security level acceptable to the user of the first network entity 12, the quality of the service provided to the user of the first network entity, etc. as explained above. The querying of the SCP 36 database is shown as message flows "6", "7", "8" and "9".

The routing number (the address of the entity 18) as far as the circuit switched network 102 is concerned is a combination of the destination point code (DPC) and a subsystem number (SSN). The DPC-SSN pair facilitates routing of the initial addressing message (IAM) from the originating SSP 32 which receives the message "1" via one or more SSPs 32 to a terminating STP 34. The terminating STP 34 is co-located with the signalling gateway 106 that interfaces to the IP network 104 on the other side. The flow of the IAM message from the initiating SSP 32, which receives the initial message "1", is identified by communications "10", "11", "12" and "13".

The terminating STP 34 passes the IAM message on to the signalling gateway 106 (message "14"). The signalling gateway 106 encapsulates the IAM message within an IP packet and transmits the IP packet onto a media gateway controller 130 (message "15"). The message

gateway controller 130 then instructs the appropriate media gateway 108 to setup a connection in the circuit switched portion of the first network 102 represented by the switches 112, (communications "16" and "17"). The MGC 130 also may optionally communicate with the entity 18. A H.323 RAS sequence and H.225.0 call sequence completes the portion of the call between the media gateway 108 and the entity 18 as represented by the dotted lines 114 between the media gateway 108 and the entity 18. Details of the call setup have been omitted in view of their being well known. But alternatively, the call setup may be implemented using the session initiation protocol (SIP).

As illustrated, the SSP 32 associated with the first network entity 12 and that is associated with the media gateway 108 are shown to be distinct. However, these entities may be one and the same which is likely to be the dominant deployment scenario where the media gateway is located within a central office.

The advantages of the architecture of Fig. 3 are as follows. Cost reduction is achieved, rapid deployment of service is possible and experience gained in deployment of existing SS7 networks results in no significant increase in operation, administration and management overhead when E.164-IP service is initiated in view of use of the existing infrastructure.

Furthermore, the architecture of Fig. 3 provides a highly efficient implementation in view of the managing network used by the present invention already being necessary for a user of the first network entity 12 dialing an E.164 number that has been assigned to a second network entity 18 already having to make a TCAP query to a SCP 36 to obtain the routing number (DPC-SSN pair) of the remote SCP 36. This TCAP query needs to be made irrespective of whether E.164 to IP address mapping occurs within the CSN portion of the first network 102 or within the IP network 104. Combining the E.164-IP address resolution process with the remote SSP routing number determination process results in a faster call setup. It is possible to use a single TCAP query to return both the service switching point, routing number, and the IP

address associated with the E.164 number and the above-described optional additional information.

Fig. 4 illustrates a simplified communication sequence for performing the aforementioned address mapping in which a TCAP query obtains only the address mapping information between the first and second address types of the entity from a SCP 36. The communication sequence is initiated from a SSP 32 with a command BEGIN. The original transaction identification (OTID) is set equal to X. The invoke portion of the TCAP query is set equal to 1 and includes the address in terms of an E.164 number identifying the second network entity 18. The invoke ID may be set to any integer value n which, as illustrated herein, is equal to 1 and contains an operation defining a macro to perform the E164 to IP address translation and any parameters associated with the translation operation. The transmission 200 is received by a SCP 36 which responds with a reply 202 with a message type END. The destination transaction identification DTID is set equal to X. A return result contains the invoke ID which was utilized in the communication 200, the DPC-SSN pair of the SSP 32 and the IP address of the second network entity 18.

Fig. 5 illustrates a communication sequence which includes both address mapping, as explained above in Fig. 4, and the obtaining of additional information from the SSP 36. The intermediate communications 204 and 206 indicate the fetching of additional information beyond the IP address of the second network device 18. As illustrated, the intermediate communication 204 provides an inquiry to the SSP 32 of which security level a communication from the first network entity 12 is to be used and the return 206 from the SSP specifying the security level to be used in transmitting the communications to the second network entity 18.

It should be understood that the intermediate communications 204 and 206, which are transmitted in pairs, represent a mechanism for retrieving additional information from the SCP 36 which is stored in the database therein or associated therewith to provide additional

information regarding the communications 114 between the first network entity 12 and the second network entity 18 which include, without limitation, information pertaining to level or quality of service, billing and/or the desired service provider to be used by the IP network 104 as requested by the first network entity user.

While the invention has been described in terms of a preferred embodiment, it should be understood that numerous modifications may be made thereto without departing from the spirit and scope of the present invention. For example, while a preferred embodiment of the present invention involves telephone functions, it should be understood that the invention is not limited to telephone applications and furthermore, is applicable to permitting networks having different addressing mechanisms for entities therein to cross communicate through gateways with utilization of the managing control network of the initiating network. Furthermore, the communications are not limited to telephone functions and may be any type of information transmitted to the second network which preferably is information transmitted as packets in a packet data network. It is intended that all such modifications fall within the scope of the appended claims.

CLAIMS

1. A communication system comprising:

a first network containing a plurality of first network entities which originate and receive first network communications and to which the first network communications are addressed by a first address type associated therewith;

a second network, coupled to the first network, containing a plurality of second network entities which originate and receive second network communications and to which the second network communications are addressed by a second address type associated therewith and which, in response to the second type of address, transmits second network communications associated with the second address type to at least one second network entity, the second network also receiving first network communications from the first network entities and delivering the first network communications to at least one second network entity; and

a managing network, associated with the first network, which manages operation of the first network including first network communication setup and routing and control thereof and which provides address mapping between an address of the first type of the at least one second network entity to which a first network communication is addressed and an assigned address of the second type of the at least one second network entity and provides the assigned address to the second network in association with the second network communications; and wherein the

the second network delivers the first network communication to the at least one second network entity addressed with the assigned address of the second type associated with the first network communication.

2. A communication system in accordance with claim 1 wherein:

the first network is a circuit switched network; and

the second network is a packet data network.

3. A communication system in accordance with claim 2 wherein:

the first address type is an E.164 address; and

the second address type is an IP address.

4. A communication system in accordance with claim 3 wherein:

the first network communication is a telephone communication.

5. A communication system in accordance with claim 1 wherein:

the managing network is an SS7 network.

6. A communication system in accordance with claim 2 wherein:

the managing network is an SS7 network.

7. A communication system in accordance with claim 3 wherein:

the managing network is an SS7 network.

8. A communication system in accordance with claim 4 wherein:

the managing network is an SS7 network.

9. A communication system in accordance with claim 5 wherein:

the managing network uses at least one service control point (SCP) to provide the mapping between an address of the first type of at least one second network entity to which the first network communications are addressed from the first network entity and the associated address of the second type to which the first network communications are transmitted by the second network in response to the associated address of the second type.

10. A communication system in accordance with claim 9 wherein:

a transaction capability application part (TCAP) query is used to accomplish the setup and address mapping.

11. A communication system in accordance with claim 6 wherein:

the managing network uses at least one service control point (SCP) to provide the mapping between an address of the first type of at least one second network entity to which the first network communications are addressed from the first network entity and the assigned address of the second type to which the first network communications are transmitted by the second network in response to the associated address of the second type.

12. A communication system in accordance with claim 11 wherein:

a transaction capability application part (TCAP) query is used to accomplish the setup and address mapping.

13. A communication system in accordance with claim 7 wherein:

the managing network uses at least one service control point (SCP) to provide the mapping between an address of the first type of at least one second network entity to which the first network communications are addressed from the first network entity and the associated address of the second type to which the first network communications are transmitted by the second network in response to the associated address of the second type.

14. A communication system in accordance with claim 13 wherein:

a transaction capability application part (TCAP) query is used to accomplish the setup and address mapping.

15. A communication system in accordance with claim 8 wherein:

the managing network uses at least one service control point (SCP) to provide the mapping between an address of the first type of at least one second network entity to which the first network communications are addressed from the first network entity and the associated address of the second type to which the first network communications are transmitted by the second network in response to the associated address of the second type.

16. A communication system in accordance with claim 16 wherein:

a transaction capability application part (TCAP) query is used to accomplish the setup and address mapping.

17. A communication system in accordance with claim 9 wherein:

the managing network further obtains from at least one service control point (SCP) information stored therein identifying a level of service to be used at least in part in completing the first network communications between the first network entity addressing the first network communications and the at least one second network entity to which the first network communications are addressed and uses the obtained information to complete the transmission of the first network communication between the first network entity and the at least one second network entity at least in part with the level of service.

18. A communication system in accordance with claim 9 wherein:

the at least one service control point (SCP) stores additional information qualifying the first network communications between a first network entity originating the first network communications and at least one second network entity receiving the first network communications.

19. A communication system in accordance with claim 18 wherein:

the additional information specifies a security level to be used in the first network communications between the first network entity originating the first network communications and the at least one second network entity receiving the first network communications which controls at least in part transmission of the first network communications between the first and second network entities.

20. A communication system in accordance with claim 18 wherein:

the additional information specifies a quality of service to be used at least in part in transmitting the first network communications between the first network entity originating the

first network communications and the at least one second network entity receiving the first network communications.

21. A communication system in accordance with claim 18 wherein:

the additional information specifies a billing mechanism to be used at least in part in charging for the first network communications transmitted between the first network entity originating the first network communications and the at least one second network entity receiving the first network communications.

22. A communication system in accordance with claim 18 wherein:

the additional information identifies at least one service provider to be used by the second network in delivering the first network communications by the second network to at least one second network entity.

23. A communication system in accordance with claim 10 wherein:

a single transaction capability application (TCAP) query is used to provide setup and address mapping.

24. A method of communication in a communication system including a first network containing a plurality of first network entities which originate first network communications and to which the first network communications are addressed by a first address type, a managing network, associated with the first network, which manages operation of the first network including communication setup and routing and control thereof, and a second network, coupled to the second network, containing a plurality of second network entities which originate second network communications and to which the second network communications are addressed by a second address associated therewith and which, in response to the second type of address transmits the second network communications associated with the second address type to at least one second network entity with the second network also receiving first network communications

from the first network entities and delivering the received first network communications to at least one second network entity comprising:

originating a first network communication from a first network entity for transmission to at least one second network entity;

using the managing network to setup and route the first network communication to the second network and to map an address of the first type of the at least one second network entity to which the first network communication is addressed with an assigned address of the second type of the at least one second network entity to which the first communication is addressed; and

transmitting the first network communication in response to the assigned address of the second type with the second network to the at least one second network entity.

25. A method in accordance with claim 24 wherein:

the first network is a circuit switched network; and

the second network is a packet data network.

26. A method in accordance with claim 25 wherein:

the first address type is an E.164 address; and

the second address type is an IP address.

27. A method in accordance with claim 26 wherein:

the first network communication is a telephone communication.

28. A method in accordance with claim 24 wherein:

the managing network is an SS7 network.

29. A method in accordance with claim 25 wherein:

the managing network is an SS7 network.

30. A method in accordance with claim 26 wherein:

the managing network is an SS7 network.

31. A method in accordance with claim 27 wherein:

the managing network is an SS7 network.

32. A method in accordance with claim 28 wherein:

the managing network uses at least one service control point (SCP) to provide the mapping between an address of the first type of at least one second network entity to which the first network communications are addressed from the first network entity and the associated address of the second type to which the first network communication is transmitted by the second network in response to the associated address.

33. A method in accordance with claim 32 wherein:

a transaction capability application part (TCAP) query is used to obtain a routing number of the at least service control point storing the address mapping.

34. A method in accordance with claim 29 wherein:

the managing network uses at least one service control point (SCP) to provide the mapping between an address of the first type of at least one second network entity to which the first network communications are addressed from the first network entity and the associated address of the second type to which the first network communication is transmitted by the second network in response to the associated address.

35. A method in accordance with claim 34 wherein:

a transaction capability application part (TCAP) query is used to obtain a routing number of the at least service control point storing the address mapping.

36. A method in accordance with claim 30 wherein:

the managing network uses at least one service control point (SCP) to provide the mapping between an address of the first type of at least one second network entity to which the first network communications are addressed from the first network entity and the associated address of the second type to which the first network communication is transmitted by the second network in response to the associated address.

37. A method in accordance with claim 36 wherein:

a transaction capability application part (TCAP) query is used to obtain a routing number of the at least service control point storing the address mapping.

38. A method in accordance with claim 31 wherein:

the managing network uses at least one service control point (SCP) to provide the mapping between an address of the first type of at least one second network entity to which the first network communications are addressed from the first network entity and the associated address of the second type to which the first network communication is transmitted by the second network in response to the associated address.

39. A method in accordance with claim 38 wherein:

a transaction capability application part (TCAP) query is used to obtain a routing number of the at least service control point storing the address mapping.

40. A method in accordance with claim 32 wherein:

the managing network further obtains from at least one service control point (SCP) information stored therein identifying a level of service to be used at least in part in completing the first network communications between the first network entity addressing the first network communications and the at least one second network entity to which the first network communications are addressed and uses the obtained information to complete the transmission of the first network communication between the first network entity and the at least one second network entity at least in part with the level of service.

41. A method in accordance with claim 32 wherein:

the at least one service control point (SCP) stores additional information qualifying the first network communications between a first network entity originating the first network communications and at least one second network entity receiving the first network communications.

42. A method in accordance with claim 41 wherein:

the additional information specifies a security level to be used in the first network communications between the first network entity originating the first network communications and the at least one second network entity receiving the first network communications which controls at least in part of transmission of the first network communications between the first and second network entities.

43. A method in accordance with claim 42 wherein:

the additional information specifies a quality of service to be used at least in part in transmitting the first network communications between the first network entity originating the first network communications and the at least one second network entity receiving the first network communications.

44. A method in accordance with claim 42 wherein:

the additional information specifies a billing mechanism to be used at least in part in charging for the first network communications transmitted between the first network entity originating the first network communications and the at least one second network entity receiving the first network communications.

45. A method in accordance with claim 42 wherein:

the additional information identifies at least one service provider to be used by the second network in delivering the first network communications by the second network to at least one second network entity.

46. A method in accordance with claim 33 wherein:

a single transaction capability application query is used to setup the first network communications addressed to the at least one second network entity and the address mapping.

FIG. 1
(PRIOR ART)

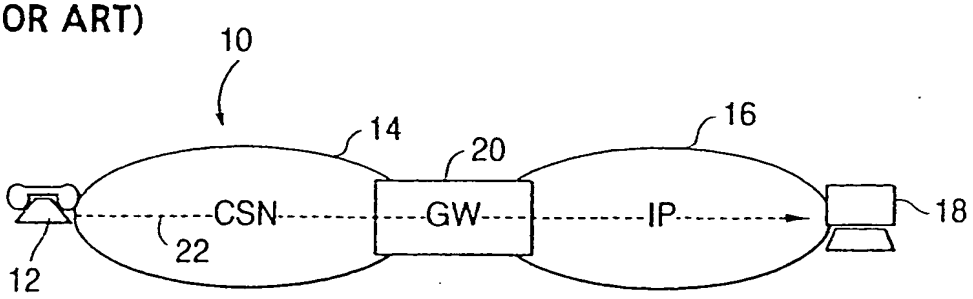
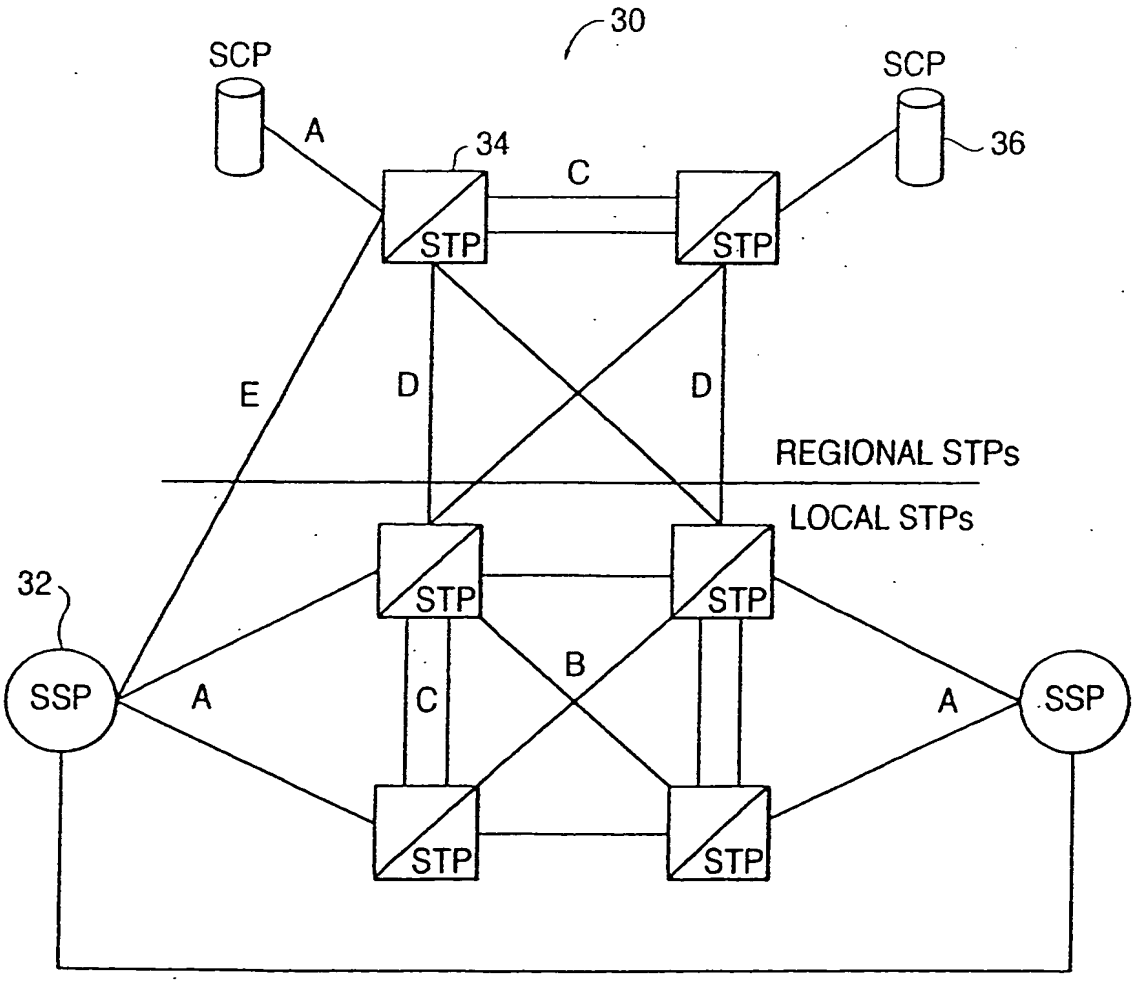


FIG. 2
(PRIOR ART)



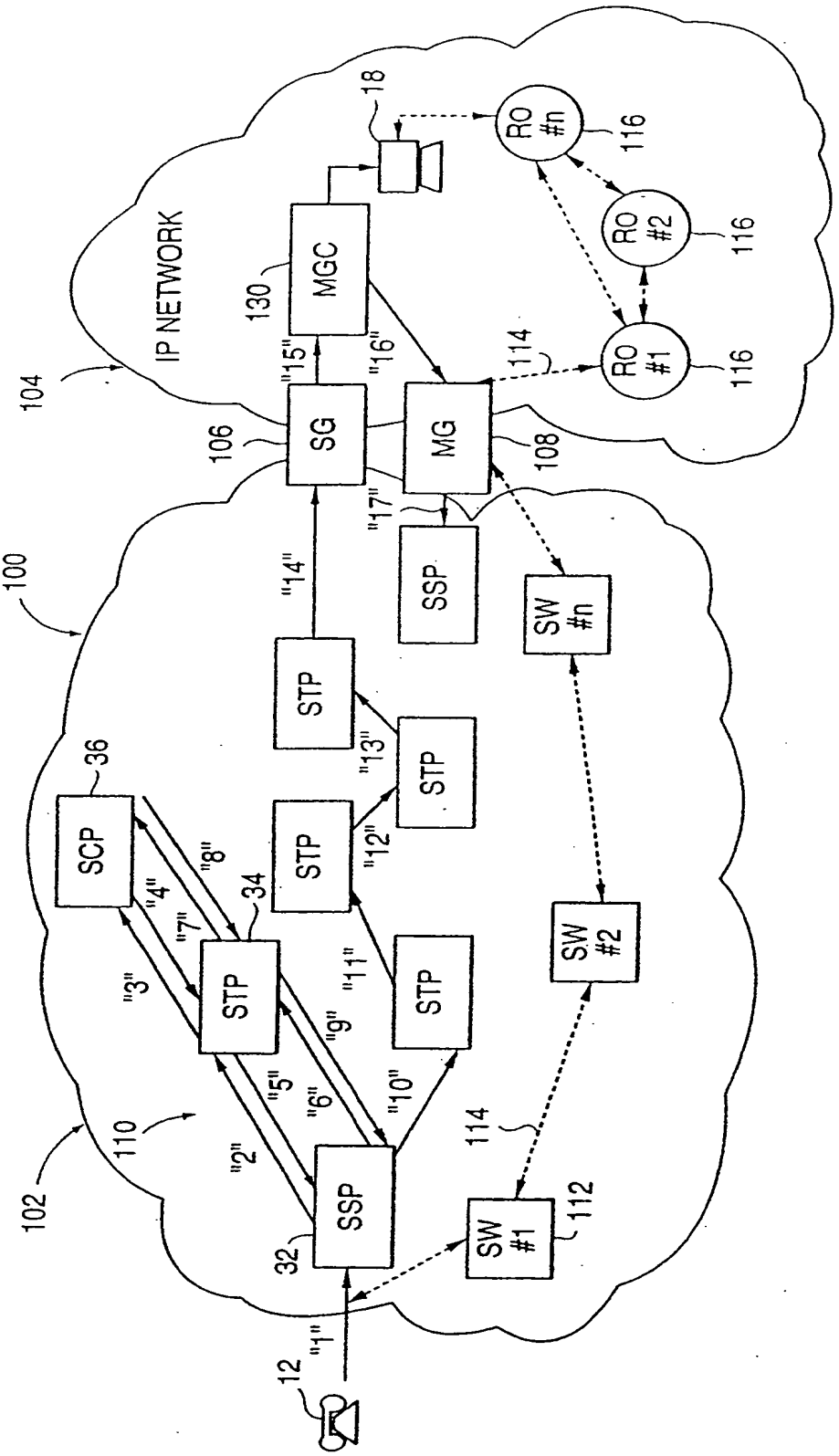

IP NETWORK
104
18
RO #n
116
RO #2
116
RO #1
116
130
MGC
"15"
"16"
114
106
SG
MG
108
"17"
SSP
SW #n
100
"14"
STP
"13"
STP
36
SCP
"8"
"4"
"7"
34
STP
"12"
STP
"3"
"11"
SW #2
STP
"9"
"5"
"6"
"10"
110
"2"
114
102
SSP
SW #1
112
32
"1"
12

FIG. 3

FIG. 4

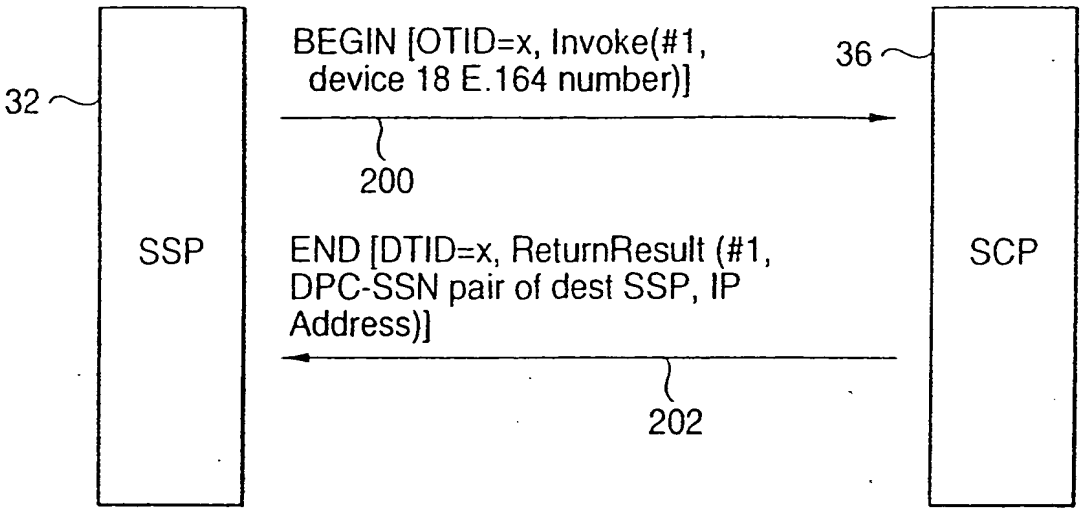
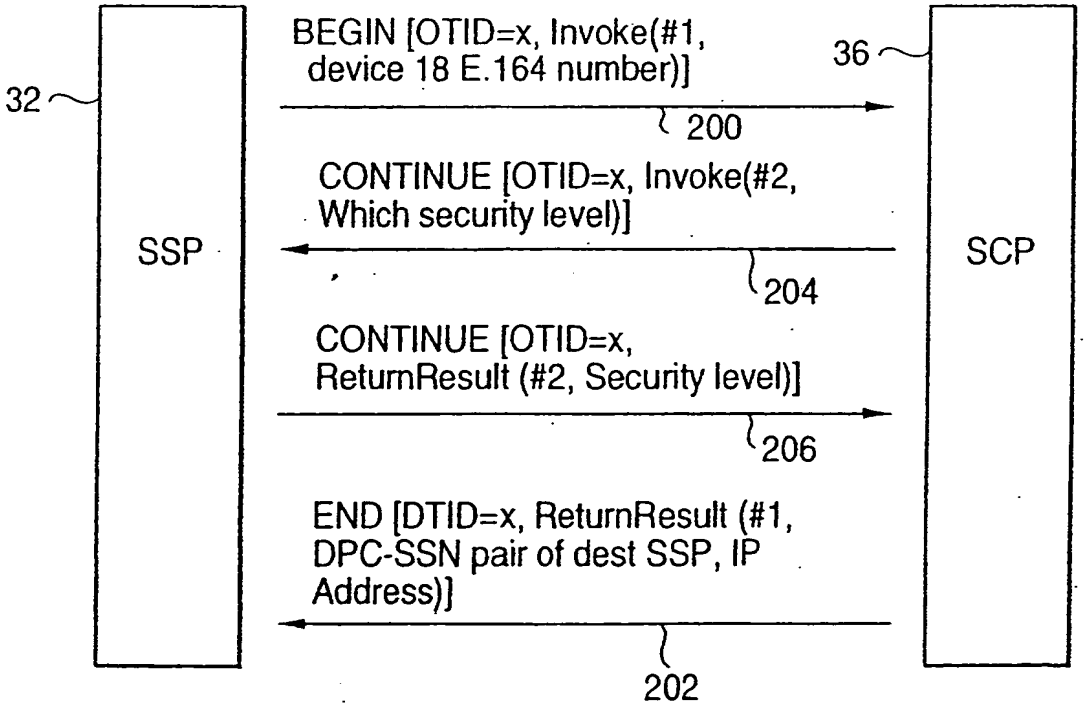

32
SSP
BEGIN [OTID=x, Invoke(#1, device 18 E.164 number)]
200
36
SCP
END [DTID=x, ReturnResult (#1, DPC-SSN pair of dest SSP, IP Address)]
202

FIG. 5


32
SSP
BEGIN [OTID=x, Invoke(#1, device 18 E.164 number)]
200
36
SCP
CONTINUE [OTID=x, Invoke(#2, Which security level)]
204
CONTINUE [OTID=x, ReturnResult (#2, Security level)]
206
END [DTID=x, ReturnResult (#1, DPC-SSN pair of dest SSP, IP Address)]
202

INTERNATIONAL SEARCH REPORT

Intern ıal Application No
PCT/US 00/25624

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04M7/00 H04Q3/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04M H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	LOW C: "THE INTERNET TELEPHONY RED HERRING" HP LABORATORIES TECHNICAL REPORT,XX,XX, no. 96/98, 15 May 1996 (1996-05-15), pages 1-15, XP002043669	1-9,11, 13,15, 24-32, 34,36,38
Y	the whole document	10,12, 14, 16-22, 33,35, 37,39-46

-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
30 November 2000	08/12/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Megalou, M

1

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Intern ...al Application No
PCT/US 00/25624

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 97 31491 A (RAGUIDEAU NICOLAS ;BEYSCHLAG ULF (FR); BOUTHORS NICOLAS (FR); LOW) 28 August 1997 (1997-08-28)	1-9,11, 13,15, 24-32, 34,36,38
Y	page 15, line 25 -page 21, line 20; figures 5,6	10,12, 14, 16-22, 33,35, 37,39-46
Y	OROZCO-BARBOSA L ET AL: "Design and performance evaluation of intelligent multimedia services" COMPUTER COMMUNICATIONS,NL,ELSEVIER SCIENCE PUBLISHERS BV, AMSTERDAM, vol. 20, no. 4, 1 June 1997 (1997-06-01), pages 219-232, XP004126680 ISSN: 0140-3664 the whole document	10,12, 14,16, 33,35, 37,39
Y	EP 0 866 625 A (SIEMENS AG) 23 September 1998 (1998-09-23) the whole document	17-22, 40-45
A	MIZUNO O ET AL: "ADVANCED INTELLIGENT NETWORK AND THE INTERNET COMBINATION SERVICE AND ITS CUSTOMIZATION" IEICE TRANSACTIONS ON COMMUNICATIONS,JP,INSTITUTE OF ELECTRONICS INFORMATION AND COMM. ENG. TOKYO, vol. E81-B, no. 8, 1 August 1998 (1998-08-01), pages 1574-1581, XP000788463 ISSN: 0916-8516 the whole document	1-46
A	HUBAUX J -P ET AL: "THE IMPACT OF THE INTERNET ON TELECOMMUNICATION ARCHITECTURES" COMPUTER NETWORKS AND ISDN SYSTEMS,NL,NORTH HOLLAND PUBLISHING. AMSTERDAM, vol. 31, no. 3, 11 February 1999 (1999-02-11), pages 257-273, XP000700322 ISSN: 0169-7552 the whole document	1-46
P,A	WO 99 57915 A (BELL CANADA) 11 November 1999 (1999-11-11) abstract	1-46

-/--

1

INTERNATIONAL SEARCH REPORT

Intern. nal Application No
PCT/US 00/25624

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 96 38018 A (KOPONEN HARRI ;KAAKKOLA MATTI (FI); MELEN BJOERN (FI); VAEAENAENEN) 28 November 1996 (1996-11-28) page 4, line 25 -page 5, line 25	1-4, 24-27
A	MAMAIS G K ET AL: "Design and implementation of a broadband intelligent peripheral" COMPUTER COMMUNICATIONS,NL,ELSEVIER SCIENCE PUBLISHERS BV, AMSTERDAM, vol. 22, no. 10, 25 June 1999 (1999-06-25), pages 942-954, XP004178596 ISSN: 0140-3664 paragraph '06.2!	17-22, 40-45
A	WO 98 36542 A (TELIA AB PUBL ;KRAMPELL MAGNUS (SE); JOHANSSON MAGNUS (SE)) 20 August 1998 (1998-08-20)	
A	GBAGUIDI C ET AL: "A PROGRAMMABLE ARCHITECTURE FOR THE PROVISION OF HYBRID SERVICES" IEEE COMMUNICATIONS MAGAZINE,US,IEEE SERVICE CENTER. PISCATAWAY, N.J, vol. 37, no. 7, July 1999 (1999-07), pages 110-116, XP000835312 ISSN: 0163-6804	

1

INTERNATIONAL SEARCH REPORT

...ormation on patent family members

Intern ...al Application No
PCT/US 00/25624

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9731491 A	28-08-1997	AU 704385 B	22-04-1999
		AU 1104697 A	03-07-1997
		CA 2239408 A	19-06-1997
		CN 1208535 A	17-02-1999
		EP 0867093 A	30-09-1998
		EP 0882366 A	09-12-1998
		WO 9722212 A	19-06-1997
		JP 2000505609 T	09-05-2000
		NO 982514 A	05-08-1998
		NZ 323992 A	28-10-1998
EP 0866625 A	23-09-1998	CN 1251243 T	19-04-2000
		WO 9842147 A	24-09-1998
		EP 0968616 A	05-01-2000
WO 9957915 A	11-11-1999	AU 3696199 A	23-11-1999
WO 9638018 A	28-11-1996	FI 961690 A	25-11-1996
		AU 708519 B	05-08-1999
		AU 5916696 A	11-12-1996
		BR 9609190 A	11-05-1999
		CA 2221183 A	28-11-1996
		CN 1185268 A	17-06-1998
		EP 0829181 A	18-03-1998
		JP 11505973 T	25-05-1999
		NO 975343 A	21-01-1998
WO 9836542 A	20-08-1998	SE 511796 C	29-11-1999
		SE 9700493 A	14-08-1998